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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,660	11/14/2003	Frank G. Belmonte	37,481	9847

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EXAMINER	
OH, TAYLOR V	

ART UNIT	PAPER NUMBER
1625	

NOTIFICATION DATE	DELIVERY MODE
05/07/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/713,660	BELMONTE ET AL.	
	Examiner	**Art Unit**	
	Taylor Victor Oh	1625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _24 April 2008_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-28_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-28_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _14 November 2003_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/24/08 has been entered.

The Status of Claims:

Claims 1-28 are pending.

Claims 1-28 are rejected.

DETAILED ACTION

1. Claims 1-28 are under consideration in this Office Action.

Priority

2. None.

Drawings

3. The drawings filed on 11/14/03 are accepted by the examiner.

Claim Rejections - 35 USC § 103

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Housley et al (US 2001/0007910) in view of Spiller et al (US 2,962,361).

Housley et al teaches a process for producing carboxylic acids in the followings as seen from the abstract :

Improved process for producing carboxylic acids or their esters by catalytic liquid phase oxidation of a corresponding precursor in a suitable solvent comprising feeding the reactants to a first oxidation reaction zone at high pressure and high solvent ratio, wherein uptake of oxygen is limited to less than 50% of the oxygen required for full conversion of the precursor to its corresponding carboxylic acid, and then feeding the resulting reaction medium to a second oxidation reaction zone.

a mixture comprising (i) recycled solvent, recycled mother liquor and catalyst, line **11**, (ii) reactor condensate from the second reactor, line **12**, and (iii) fresh acetic acid make-up, line **13**. The mixed feed stream will contain typical catalyst components (e.g., Co, Mn, Br), at generally diluted concentrations from what would normally be present when using a single conventional oxidation reactor. Optionally, but not shown, control of catalyst concentration in the first reaction zone can be achieved by bypassing some of the catalyst-containing mother liquor, line **11**, directly to second reactor **20**.

[0033] The paraxylene feed **16** may optionally be premixed with acetic acid solvent and introduced into the system either upstream or downstream of feed pump **14**. Optionally, but not shown, a portion of paraxylene feed **16** may bypass reactor **15** and be fed directly to second reactor **20**. The reaction medium which results in the first reactor has an acetic acid:paraxylene ratio in the range of from 10-25:1. Best results have been observed when the acetic acid:paraxylene mass ratio is from 10-20:1.

[0036] The feed stream to the first reaction zone, line **10**, contains typical oxidation catalyst components (e.g., Co, Mn, Br), but diluted by a factor of about 3 to 5 relative to the catalyst concentration in recycled mother liquor from product recovery, line **11**. The catalyst concentration is subsequently raised to more conventional catalyst concentration levels when and as solvent is vaporized and removed overhead in the second reaction zone **20**. The total catalyst metals concentration in the first reaction zone will typically lie in the range 200 to 1,000 ppm w/w, whereas the catalyst metals concentration in the second reaction zone will typically lie in the range 600 to 3,000 ppm w/w. When using a Co and Mn metal catalyst system, the total catalyst metals concentration in the first reaction zone should preferably be controlled at greater that about 400 ppm w/w for good catalyst selectivity and activity.

[0037] The oxidation reaction is highly exothermic. Depending on the oxygen uptake and solvent ratio and without a means of cooling the reaction, the heat of reaction could raise the temperature of the first reaction medium to a value higher than the second reactor operating temperature and/or higher than 210° C. A relatively low first reactor exit temperature is desirable to minimize solvent and precursor degredation (i.e., burn) and to eliminate solvent flashing as the pressure of the reaction medium is reduced on entry into the second reaction zone. The first reaction zone may therefore include a cooling coil **18** or employ some other internal or external means for removing heat from the reactor (and reaction medium) to control the exit temperature of the reaction medium below 210° C., and preferably below the second reactor operating temperature. It is impor-

The instant invention, however, differs from the prior art in that 7 to 60 wt percent of the one disubstituted benzene is introduced ; the claimed temperature in the first oxidation stage is at least 5.5 ^{0} F lower than that in the second oxidation stage.

Spiller et al teaches a countercurrent oxidation system for oxidizing substituted aromatic hydrocarbons so as to produce carboxylic acids.

It is suitable for oxidizing mixed xylenes with an oxygen concentration of 8 to 9 percent (see col. 2. lines 11-15) in the presence of oxidizing catalyst selected from the group consisting of manganese, cobalt, nickel, chromium, vanadium,cerium or mixtures and a bromine promoter (see col. 3 , lines 41-45) in the range of 1:10 to 10:1 atoms of catalyst metal per atoms of bromine (see col. 3, lines 53-60) to produce the mixed dicarboxylic acids in such a form that they may be separated into phthalic acid, terephthalic acid (see col. 1 ,lines 35-42). In addition, the preferred mixed metal catalysts are mixtures of manganese with cobalt acetate with a proportion of 1 to 2

parts by weight of manganese salt per part by weight of the other metal compound (see col. 4 ,lines 36-67).

The oxidizing gas introduced at the base of vessel **33** may be largely the free oxygen contained in the total gas stream which is introduced by line **26*b*** directly into the base of vessel **33**. Additional air or oxygen may be introduced through line **39** in amounts controlled by valve **40**, this last named valve regulating the amount of introduced air or oxygen in order to prevent the oxygen concentration in receiver **24*a*** or condenser **23*a*** or line **26*a*** from exceeding 8 volume percent. The total gas stream from line **26*a*** is introduced at the base of reactor **11** for supplying oxidizing gas thereto and, here again, additional air or oxygen may be introduced through line **41** in amounts controlled by valve **42** for preventing the oxygen concentration in receiver **24**, condenser **23** or line **26** from exceeding 8 volume percent

(it is preferably zero). In this particular example vessel **11** is operated at about 160 p.s.i.g. and 375° F., vessel **33** at about 300 p.s.i.g. and 380° F. while vessel **36** is operated at about 400 p.s.i.g. and at 400° F., the holding time in each of the vessels being about 20 to 30 minutes. It is preferred that a substantial amount of the oxidation occur in each vessel and that the acetic acid concentration in each vessel be at least about 80 percent by weight, maximum yields being obtained if water is removed from the final reactor substantially as fast as it is formed. Some water and solvent is of course recycled from each of the latter reactors to the next preceding reactor along with the gas stream and a portion of the water of reaction is ultimately removed from the oxidizers through line **26** along with a certain amount of acetic acid which is recovered in tower **27** as hereinabove described.

Furthermore, the stage-wise continuous counter current oxidation system is "**particularly advantageous in that it enables practically quantitative oxygen utilization with minimum hazard and without substantial detriment to product yield** " (see col. 2 ,lines 1-4).

Moreover, some water and solvent are recycled from the each of the latter reactors to the preceding reactor along with the gas stream (see col. 4 ,lines 60-67) as shown in fig 2 (a front page).

Concerning the introduction of 7 to 60 wt percent of the one disubstituted benzene into the first reactor, the limitation of a process with respect to time, temperature , and concentration does not impart patentability to a process when such values are those which would be determined by one of the ordinary skill in the art in achieving optimum operation of the process. The concentration of the initial material in the oxidation process is well-understood by those of ordinary skill in the art to be a result-effective variable., especially when attempting to control selectivity of the process.

Housley et al expressly teaches a process for producing carboxylic acids by feeding paraxylene, oxygen , acetic acid , some catalyst in a series of two reactors; Baldwin et al expressly teaches the countercurrent oxidation system for oxidizing substituted aromatic hydrocarbons so as to produce the corresponding carboxylic acids in a series of two reactors under specific reaction conditions (e.g. specific molar ratio of the catalyst, the reaction temperature of the second reactor). Both prior art processes are commonly involved with the oxidation of the substituted aromatic

hydrocarbons so as to produce the corresponding carboxylic acids under similar reaction conditions (catalyst composition and reaction temperature).

Furthermore, Baldwin et al has offered guidance that the stage-wise continuous counter current oxidation system is "**particularly advantageous in that it enables practically quantitative oxygen utilization with minimum hazard and without substantial detriment to product yield**" (see col. 2 ,lines 1-4).

Therefore, it would have been obvious to the skilled artisan in the art to be motivated to incorporate the teaching of Baldwin et al into the Housley et al process in order to achieve a high quality desired product along with practical quantitative oxygen utilization with minimum hazard.

Applicants' Argument

A. Applicants argue the following issues:

a. Spiller does not teach obtaining improved oxygen utilization when the concentration of residual molecular oxygen in the gas removed from the first oxidation stage is about 0.3 to about 2 volume percent;

b. Housley et al do not teach recycling unreacted oxygen from the second oxidation stage to the first oxidation stage to obtain high oxygen utilization.

c. Spiller does not teach the introduction of a portion or all of the total amount of the feed mixture into the second oxidation stage .

The applicants' argument have been noted, but these arguments are not persuasive.

First, with respect to the first argument, the Examiner has noted applicants' argument. However, on the contrary to applicants' argument, Spiller expressly teaches that " the gas phase in 23*b*, 24*b* and 26*b* should contain less than 8 percent oxygen " (see col. 4 ,lines 32-33). From this, it does read on the claimed limitation. Therefore, applicants' argument is not persuasive.

Second, with respect to the second argument, the Examiner has noted applicants' argument. However, on the contrary to applicants' argument, Housley et al expressly teaches the followings (see page 3 , lines 2-12):

> a mixture comprising (i) recycled solvent, recycled mother liquor and catalyst, line **11**, (ii) reactor condensate from the second reactor, line **12**, and (iii) fresh acetic acid make-up, line **13**. The mixed feed stream will contain typical catalyst components (e.g., Co, Mn, Br), at generally diluted concentrations from what would normally be present when using a single conventional oxidation reactor. Optionally, but not shown, control of catalyst concentration in the first reaction zone can be achieved by bypassing some of the catalyst-containing mother liquor, line **11**, directly to second reactor **20**.

From this paragraph, it becomes clear that unreacted oxygen from the second oxidation stage can be recycled to the first oxidation stage in view of "recycled mother liquor (which contains oxygen)." Therefore, applicants' argument is not persuasive.

Third, with respect to the third argument, the Examiner has noted applicants' argument. However, on the contrary to applicants' argument, the primary Housley et al prior art expressly teaches the followings (see page 3 , paragraph #0033):

> Optionally, but not shown, a portion of paraxylene feed **16** may bypass reactor **15** and be fed directly to second reactor **20**. The reaction medium which results in the first reactor has an acetic acid:paraxylene ratio in the range of from 10-25:1. Best results have been observed when the acetic acid:paraxylene mass ratio is from 10-20:1.

Therefore, the prior art is still relevant to the claimed invention. Thus, applicants' argument is not persuasive.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Taylor Victor Oh whose telephone number is 571-272-0689. The examiner can normally be reached on 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet Andres can be reached on 571-272-0867. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Taylor Victor Oh/
Primary Examiner, Art Unit 1625
5/1/2008

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